BRÜEL & KJÆR
Nærum - Denmark

Service Instructions
Band-Pass Filter Set

1612

Consisting of:

Filter Curves	1612.1
Weighting Network	1612.2
Level Adjustment	1612.3
Complete Adjustment	1612.4
Octave-Frequency Table	1612.5
Automatic Switching Device	1612.6
Position of Components	1612.7
Parts List	1612.8
Circuit Diagram	1612.9

Removal of the Metal Case.

After removing the four threaded retainers at the back of the instrument, it is possible to slide the chassis and the front panel out of the case.

Trouble Shooting.

If the reason for a fault is not an obvious one such as faulty transistor, broken down resistor, etc., then first test the voltages of the transistors and compare them with the voltages shown in the printed circuit (Position of components 1612.7) in order to localize the defect. Should this method of finding the fault prove unsuccessful, then check the instrument by adopting the method described in the adjustment procedure. To correct a fault in a filter the filter drawer in question must be taken out. This can be done after the leads to the drawer have been unsoldered and the two screws which hold the drawer in place removed. The drawer will be rather tight at beginning, as the other end is held firmly by a pair of springs. When the trouble has been found and remedied, the voltages and adjustments which are influenced by the remedy must be rechecked.

The tolerances stated in the instructions can only be used as a guide for adjustment and control, but any deviations must not be corrected without being sure that the tolerances of the instruments used for making the adjustment are so small as to have no influence on the measurements.

The instructions in this Manual are given purely as a guide to the service of equipment. Some faults, as f.inst. small deviations in tolerances require for their correction special control equipment and extensive experience, and in these cases it is necessary to send the instrument to the factory.

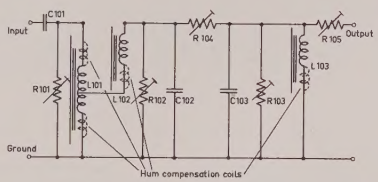
Spare Parts.

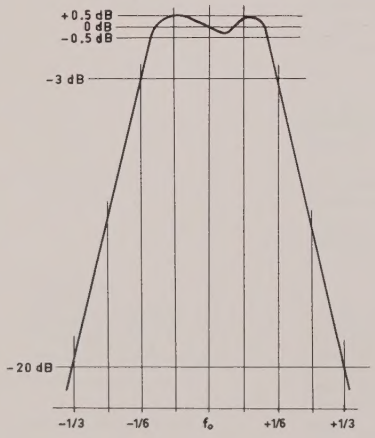
Please state type and serial number of apparatus when spare parts are ordered.

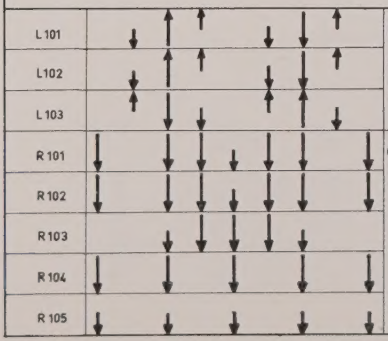
Instruments and accessories necessary for service and repair:

Multimeter (50 µA)
Frequency Analyzer type 2107
Beat Frequency Oscillator type 1022
(Beat Frequency Oscillator type 1013)
(Frequency Counter)
Pressure Gauge (30 - 50 gr)

1/3 Octave Filter





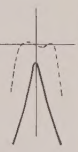
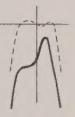
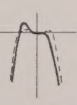


Change in filtercurve if the iron core or adjustmenttape are moved out of the coil

Change in filtercurve if the potentiometer is adjusted to a smaller resistance

Typical filtercurves for faulty filters

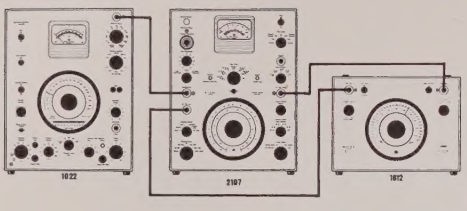
Correct filtercurve 0 dB

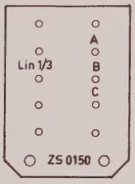
Faulty component	Adjustment procedure	Filtercurve for faulty filter
R 104.105	1612.3	
R 101.102.103	1612.4	
C 101. L 101	1612.4	
C 103. L 103	1612.4	
L 101.102.103 trimmer 'C'	1612.4	

Weighting Network

1612.2

valid from serial no. 64072





2.1. Linear

a. INPUT SWITCH:"Direct"
WEIGHTING NETWORK: "On"
FILTER SWITCH: "Lin."
FUNC.SELECTOR:"1/3 Octave"

Frequency: 1000 c/s. Adjust the input voltage for an 18 dB deflection on type 2107 (RANGE MULT.:"x1" and WEIGHTING NETWORK:"Lin.2-40ooo c/s")

Change WEIGHTING NETWORK on type 2107 to "Ext. Filter".
Change frequency to 50 c/s.
Deflection on type 2107: 17.8 - 18.2 dB.
If necessary adjust R 99 "Lin. 1/3"

Possible reasons for fault: defective transistor V1, V2
defective zener diode Q1.

d.c.voltage for transistor amplifier: Q1: approx. 12 V
V2 emitter: approx. 5 V
base: approx. 4.8 V.

Vary the frequency from 20-20ooo c/s.
Deflection on type 2107: 18 dB
Tolerance: ± o.3 dB (+ tolerance of type 1022: o.3 dB and type 2107: o.2 dB)

b. FUNC.SELECTOR to "1/1 Octave"

Vary the frequency from 20 - 20ooo c/s.
Deflection on type 2107: 18 dB (RANGE MULT.: "x o.3").
Tolerance: ± o.6 dB (+ tolerance of type 1022: o.3 dB and type 2107: o.2 dB)
If necessary change value of C 91 or R 88.

2.2. A-B-C Curves

a. INPUT SWITCH: "Direct"
WEIGHTING NETWORK: "On"
FILTER SWITCH: "Lin."
FUNC.SELECTOR:"1/3 Octave"

Frequency: 1000 c/s. Adjust the input voltage for an 18 dB deflection on type 2107 (RANGE MULT.:"x1" and WEIGHTING NETWORK: "Lin.2-40ooo c/s")

Change WEIGHTING NETWORK on type 2107 to "Ext.Filter".

b. FILTER SWITCH to curve A

Deflection on type 2107: 17.7 - 18.3 dB.
If necessary adjust R 98 "A".

c. FILTER SWITCH to curve B

Deflection on type 2107: 17.7 - 18.3 dB.
If necessary adjust R 97 "B".

d. FILTER SWITCH to curve C

Deflection on type 2107: 17.7 - 18.3 dB.
If necessary adjust R 94 "C".

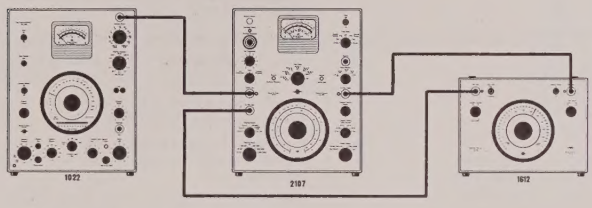
Whenever R 94, 97, 98 is adjusted item e should be checked as the settings of these potentiometers influence each other.

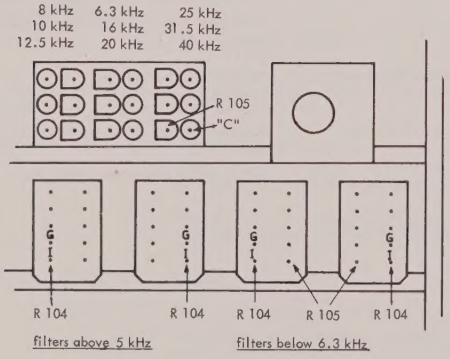
e.

Frequency c/s	Curve "A" Defl. on type 2107 dB	RANGE MULT.	Curve "B" Defl.on type 2107 dB	RANGE MULT.	Curve "C" Defl. on type 2107 dB	RANGE MULT.
20	4.6 - 12.6	X o.01	10.6 - 18.6	X o.1	8.7 - 16.7	X 1
63	10.4 - 13.9	X o.1	7.1 - 10.6	X 1	15.7 - 19.2	X 1
500	14.4 - 15.2	X 1	17.3 - 18.1	X 1	17.6 - 18.4	X 1
1000	17.7 - 18.3	X 1	17.7 - 18.3	X 1	17.7 - 18.3	X 1
2000	19.0 - 19.4	X 1	17.6 - 18.0	X 1	17.6 - 18.0	X 1
8000	15.7 - 17.4	X 1	13.8 - 15.5	X 1	13.8 - 15.5	X 1
20000	6.8 - 10.3	X 1	15.0 - 18.5	X o.3	14.9 - 18.4	X o.3

Level Adjustment

valid from serial no. 64072





3.1. 1/3 Octave Filter

a. INPUT SWITCH: "Direct"
FUNC.SELECTOR: "1/3 Octave"
WEIGHTING NETWORK: "On"

Set the frequency to the center frequency of the filter and adjust the input voltage for an 18 dB deflection on type 2107 (RANGE MULT .:"X1" and WEIGHTING NETWORK: "Lin. 2-40ooo c/s").

Change WEIGHTING NETWORK on type 2107 to "Ext.Filter".

b. FILTER SWITCH in required position
25-5ooo c/s

Vary the frequency around the center frequency of the filter and check the filter curve.
Deflection on type 2107: 18.0 - 18.5 dB for the tops
17.5 - 18.0 dB for the valleys

If necessary adjust R104 or R105.
Change frequency to + and - 1/6 octave.
Deflection on type 2107: approx. 15 dB.
After adjustment of R104-105, check 3.2

c. FILTER SWITCH in required position
6300 - 16ooo c/s

As under item b but adjust the valleys by means of R104 or R105 and the tops by means of trimmer "C".

d. FILTER SWITCH in required position
20ooo - 40ooo c/s

Check of these filters requires use of a high frequency oscillator f.inst. type 1013.

Check and tolerances as under item c.

3.2. 1/1 Octave Filter

a. INPUT SWITCH: "Direct"
FUNC. SELECTOR: "1/1 Octave"
WEIGHTING NETWORK: "On"

Set frequency to the center frequency of the filter and adjust the input voltage for an 18 dB deflection on type 2107 (RANGE MULT.:"X1" and WEIGHTING NETWORK :" Lin. 2-40000 c/s)

Change WEIGHTING NETWORK on type 2107 to "Ext.Filter" and RANGE MULT. to "Xo.3".

b. FILTER SWITCH in required position 31.5 - 63 c/s

Vary the frequency around the center frequency of the filter.

Deflection on type 2107: 18 - 20 dB for the tops
16 - 18 dB for the valleys

Change frequency to + and - 1/2 octave.
Deflection on type 2107: approx. 15 dB

If necessary to adjust the filter. Set the frequency at the point where the deflection exceeds the tolerance and note the deviation from 18 dB deflection on type 2107.

Change FUNC.SELECTOR to "1/3 Octave" and turn the FILTER SWITCH to the defect 1/3 octave filter, indicated by the greatest deflection on type 2107 (RANGE MULT.: "X1")

Change frequency to the center frequency of the defect filter and adjust the deflection on type 2107 by means of R104 to the deviation just noted from 18 dB deflection, but in opposite direction.

Then adjust R105 for a deflection on type 2107: 17.5-18.0 dB and repeat item b.

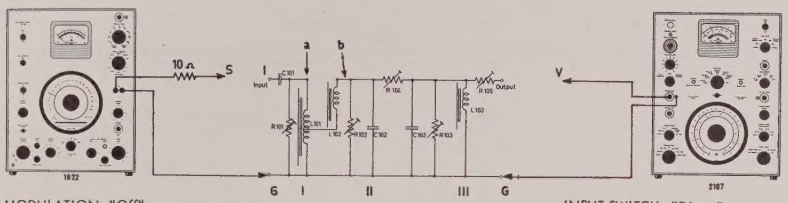
c. FILTER SWITCH in required position 125-8000 c/s

Adjustment as under item b,
but deflection on type 2107: 18 - 19 dB for the tops
17 - 18 dB for the valleys.

d. FILTER SWITCH in required position 16000 - 31000 c/s

Adjustment of these filters requires use of a high frequency oscillator f.inst. type 1013.

Adjustment and tolerances as under item c.



MODULATION: "Off"
COMPRESSOR: "Off"
MATCHING IMP.: "6Ω"

INPUT SWITCH: "Direct"
WEIGHTING NETWORK: "Lin 2-40000"
METER SWITCH: "RMS. fast"
FUNC. SELECTOR: "Selec. Section Off"

Before adjustment turn potentiometer R101-2-3 to mid. position R104 to max. resistance and R105 to min. resistance.

4.1. Adjustment of Resonant Circuit I and II

a. Reference adj.

Connect: S and V to point I
b to point G

Set the frequency to the center frequency of the filter and adjust the input voltage for an 18 dB deflection on type 2107 (RANGE MULT.:"x1" and METER RANGE: "1 V").

b. Adj.of resonant frequency L 101.

Change V to point a.

Change frequency to approx. 1% above the center frequency of the filter and adjust L 101 to max. deflection on type 2107.

c. Adj. of Q. R 101.

Adjust R101, if any (some of the low frequency filters have no R101), for a 19 dB deflection on type 2107 (RANGE MULT.:"x1" and METER RANGE "10 V")

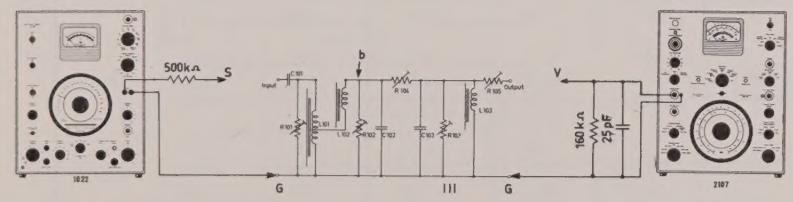
d. Adj. of resonant frequency L 102.

Connect: S to point a.
V to point b.
Filter output to point G.

Adjust L102 to max. deflection on type 2107 at the same frequency as under item b.

e. Adj. of Q. R102

Adjust R102, if any (some of the low frequency filters have no R102), for a 10 dB deflection on type 2107 (RANGE MULT.:"x0.3" and METER RANGE: "10 V".)



4.2. Adjustment of Resonant Circuit III

a. Reference Adj.

Connect: S to V.

Set the frequency to the center frequency of the filter and adjust the input voltage for an 18 dB deflection on type 2107 (RANGE MULT.:"x1" and METER RANGE: "1 V").

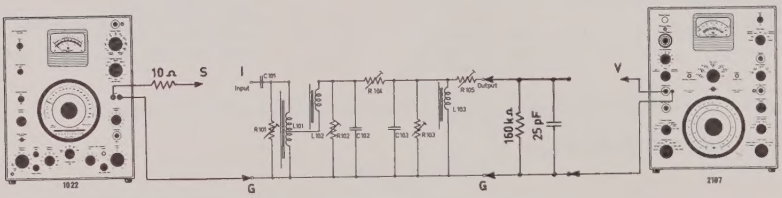
b. Adj. of resonant frequency. L 103.

Connect: S and V to filter output
b to point G

Set the frequency to approx. 1% below the center frequency of the filter and adjust L103 to max. deflection on type 2107.

c. Adj. of Q R 103.

Adjust R103, if any (some of the low frequency filters have no R103), for a 10 dB deflection on type 2107 (RANGE MULT.:"x o.3" and METER RANGE: "1 V").



Adjustment of attenuation at ± 1/6 and ± 1/3 octave requires use of a frequency counter connected to type 1022 as the accuracy of the frequency should be within o.1 - o.2%.

4.3. Adjustment of Filter Curve

a. Reference adj.

Connect: V and S to point I

Set frequency to the center frequency of the filter and adjust the input voltage for an 18 dB deflection on type 2107 (RANGE MULT.:"x1" and METER RANGE: "1 V").

b. Filter tops and valleys

Change V to filter output.

Vary the frequency around the center frequency of the filter.
Average deflection on type 2107: 18 dB.
If necessary adjust R104.

check that the 2 tops have the same height.
If necessary adjust L103.

Check the deflection on type 2107: 18.0-18.5 dB for the tops
17.5-18.0 dB for the valleys
If necessary adjust R103 (or R101-2)

c. Attenuation at ± 1/3 octave.

Check that the attenuation at ± 1/3 octave is equal.

Attenuation: Filters below 1000 c/s approx. 18 dB
Filters above " " 20 dB

If necessary adjust L101-2-3 in the same direction.

d. Attenuation at ± 1/6 octave

Check that the attenuation at ± 1/6 octave is equal.
Attenuation: approx. 3 dB
If necessary adjust L101-2-3 in the same direction.

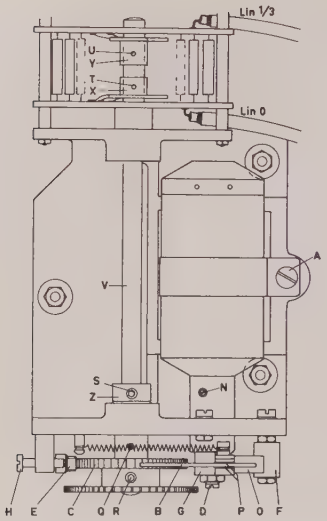
After adjustment mount the filter drawer in type 1612 and check the filter according to 1612.3.

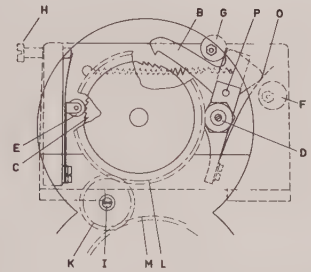
Octave-Frequency Table

− octave			center frequency	+ octave		
1/2	1/3	1/6	c/s	1/6	1/3	1/2
	10.00	11.22	12.5	14.13	15.85	
11.22	12.59	14.13	16	17.78	19.95	22.40
	15.85	17.78	20	22.40	25.10	
	19.95	22.40	25	28.20	31.60	
22.40	25.10	28.20	31.5	35.50	39.80	44.70
	31.60	35.50	40	44.70	50.10	
	39.80	44.70	50	56.20	63.10	
44.70	50.10	56.20	63	70.80	79.40	89.10
	63.10	70.80	80	89.10	100.0	
	79.40	89.10	100	112.2	125.9	
89.10	100.0	112.2	125	141.3	158.5	177.8
	125.9	141.3	160	177.8	199.5	
	158.5	177.8	200	224.0	251.0	
177.0	199.5	224.0	250	282.0	316.0	355.0
	251.0	282.0	315	355.0	398.0	
	316.0	355.0	400	447.0	501.0	
355.0	398.0	447.0	500	562.0	631.0	708.0
	501.0	562.0	630	708.0	794.0	
	631.0	708.0	800	891.0	1000	
708.0	794.0	891.0	1000	1122	1259	1413
	1000	1122	1250	1413	1585	
	1259	1413	1600	1778	1995	
1413	1585	1778	2000	2240	2510	2820
	1995	2240	2500	2820	3160	
	2510	2820	3150	3550	3980	
2820	3160	3550	4000	4470	5010	5620
	3980	4470	5000	5620	6310	
	5010	5620	6300	7080	7940	
5620	6310	7080	8000	8910	10000	11220
	7940	8910	10000	11220	12590	
	10000	11220	12500	14130	15850	
11220	12590	14130	16000	17780	19950	22400
	15850	17780	20000	22400	25100	
	19950	22400	25000	28200	31600	
22400	25100	28200	31500	35500	39800	44700
	31600	35500	40000	44700	50100	

Automatic Switching Device 1612.6

valid from serial no. 64072





6.1. Mechanical Adjustment

a. Max. operating power

Operate the FILTER SWITCH automatically, by means of pulses from a Level Recorder Type 2305 or an external DC supply (24 V, 180 mA) in series with a switch, connected to REMOTE CONTROL jack. (+ should be connected to pin 2 and – to pin 1).

Loosen screw A and rotate the motor until max. operating power is obtained.

Before retightening screw A check that the pawl B is located in the middle of the pawl wheel C.

b. Pawl mechanism

Turn the motor axle D clockwise to its limit. Check that the spring loaded locking roll E is in a position between 2 teeth on the pawl wheel C. If not loosen the nut and turn the eccentric nylon bush F to the correct position. After adjustment carefully retighten the nut.

Turn the motor axle D slowly clockwise and check the movement of the pawl B. The pawl should first move down to the pawl wheel C on a point between 2 teeth and then turn the pawl wheel one position. If not, loosen the nut and turn the eccentric nylon bush G to the correct position.
After adjustment carefully retighten the nut.

Replace the frequency pointer and the bakelite knob.

Adjust the spring load on locking roll E by means of screw H. The movement of the FILTER SWITCH should be smooth but the screw should be tightened so that the pressure can overcome the friction in the switch and move the pawl wheel back again if it is left a little out of locking position.

Operate the FILTER SWITCH automatically as under item a and check that the switching is stable, if not readjust screw H.

c. Play in the frequency pointer.

Loosen screw I and tighten it again in a position where the play between the nylon wheel K and both the metal wheels L and M is small, but without any point where the wheels are moved with force.

d. Lubricating

Apply a little thin non-acidic machine oil (e.g. sewing machine oil) only to the following parts: Motor, point N

Switching axle, point Q

Pawl mechanism, point O, P

6.2. 50 Position Switch

a. Cleaning

Remove the protecting tape from the left side of the switch.

Loosen screws R-S-T-U and pull out axle V far enough so that the rotary contacts X-Y are free.

Carefully clean the fixed and rotary contacts with a soft cloth and trichlorethylene.

b. Contact Pressure

After cleaning replace the rotary contacts X-Y and axle V, tighten the pawl wheel C and stop-bush Z in a position which allows only a slight play in the axial direction.

Adjust the rotary contacts X-Y along the axle for a contact pressure of 30-40 gr. and tighten screws T-U.

c. Check of Switch

Connect an ohmmeter across the core in the coax cable "Lin. 1/3" and the green lead connected to soldering tag "Lin. 1/3" on filter drawer ZS 0150 and turn the FILTER SWITCH to a position where the resistance is 0.

Replace the frequency scale and fix the pointer in position "Lin."

Check that the rotary contact Y is placed on the axle V in relation to the pawl wheel so that it gives contact symmetrically around the locking position. If not loosen screw U and correct the position of the rotary contact.

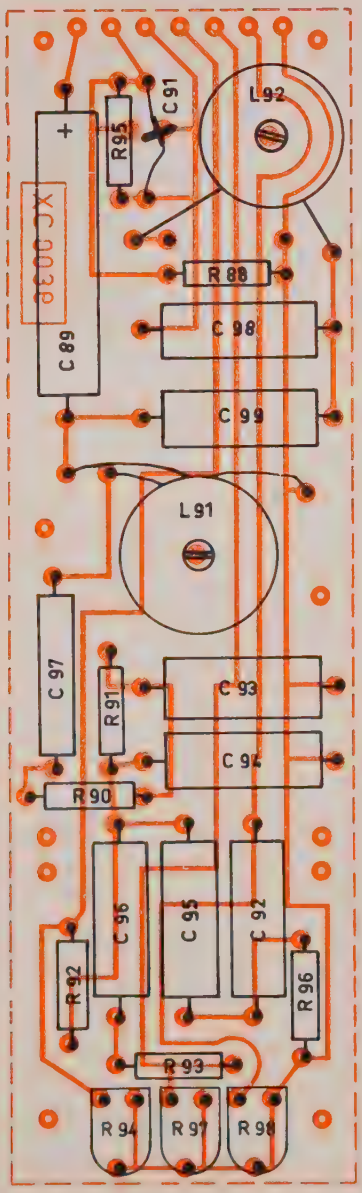
After adjustment recheck contact pressure.

Connect the ohmmeter across the core in the coax cable "Lin.0" and the red lead connected to soldering tag "Lin.0" on filter drawer ZS 0150. Set the FILTER SWITCH to "Lin."

Check the rotary contact X in the same way as rotary contact Y.

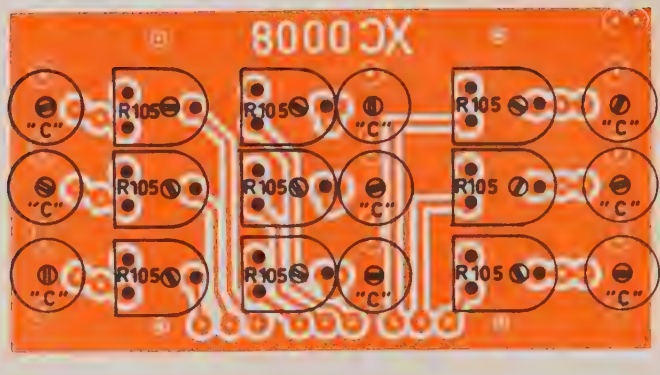
Position of Components

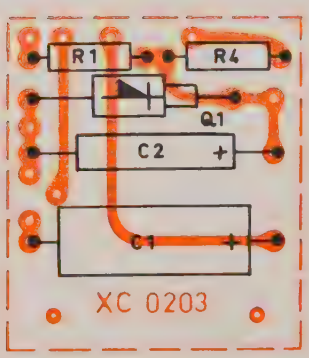
valid from serial no. 130631

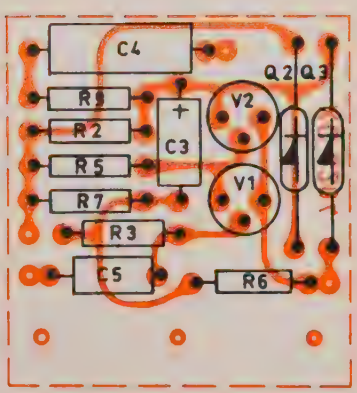


Lin 1/1 – 1/3 octave

Weighting Network
curve A-B-C

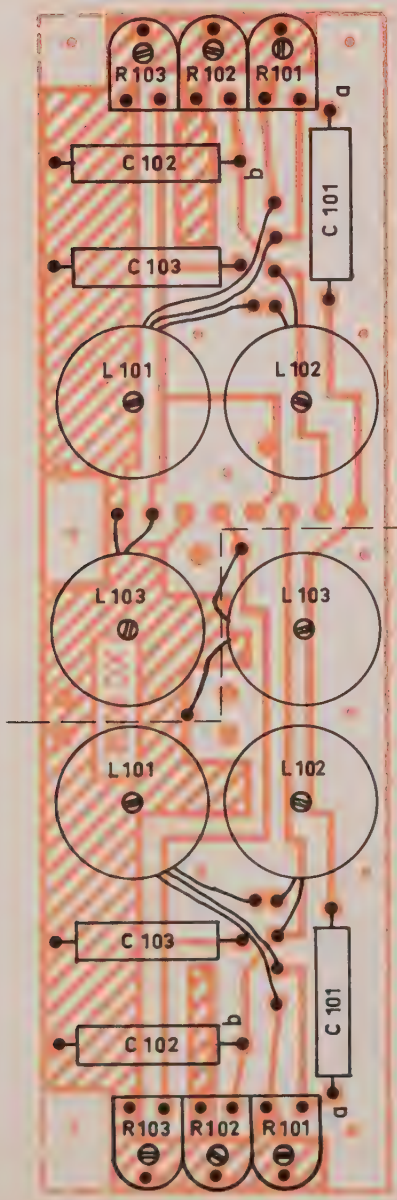

XC 0008
R105
"C"


R1
R4
Q1
C2
+
C1
+
XC 0203


C4
Q2
Q3
R8
R2
R5
R7
R3
C5
C3
+
V2
V1
R6

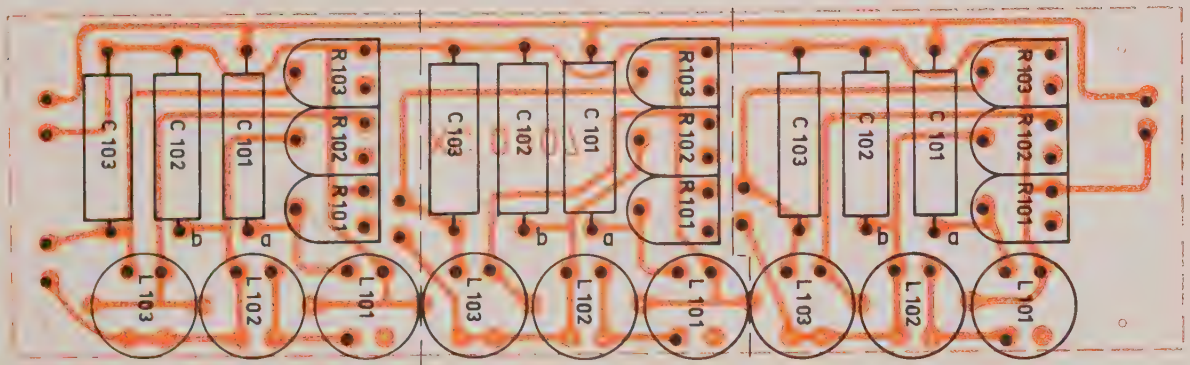
Position of Components

valid from serial no. 139535



Filter: 315 c/s
400 c/s
800 c/s
1kc/s
2k c/s
4k c/s
5kc/s

Filter: 250 c/s
500 c/s
630 c/s
1,25kc/s
1,6 kc/s
2,5 kc/s
3,15kc/s



Filter: 6,3 kc/s
16 kc/s
40 kc/s

Filter: 8 kc/s
12,5 kc/s
20 kc/s
31,5 kc/s

Filter: 10 kc/s
25 kc/s

BRÜEL & KJÆR
Nærum - Denmark

Parts-List

1612.8

valid from serial no. 171746

COMPONENT TYPE		STOCK REFERENCE		CIRCUIT DIAGRAM
CAPACITORS:				
Electrolytic	40 µF/170 V	CE	2038	C 1
"	25 µF/ 50 V	CE	8948	C 2
"	10 µF/ 15 V	CE	0001	C 3
Polyester	o.1 µF/250 V	CS	0013	C 5
"	o.47 µF/250 V	CS	0021	C 4
SWITCHES:				
Input switch		NN	0564	O 1
Weighting Network		NN	0567	O 5
Function Selector		OR	1611	O 2
Automatic switching		OX	1016	O 4
RESISTORS:				
Carbon film	1/3 W ± 10 %	RK	250 Ω	R 107
"	" "	RK	1 kΩ	R 9
"	" "	RK	12.5 kΩ	R 1
"	" "	RK	25 kΩ	R 2
"	" "	RK	50 kΩ	R 3
"	" "	RK	100 kΩ	R 4
"	" "	RK	200 kΩ	R 5
"	" "	RK	370 kΩ	R 7
"	" "	RK	430 kΩ	R 6
"	" "	RK	2 MΩ	R 8
"	1/2 W ± 10%	RK	425 kΩ	R 117-120
RECLIFIERS:				
Zener diode	12 V ± 10%	QV	1117	Q 1
Germanium diode	OA 85	QV	0085	Q 2,3,13
TRANSISTORS:				
Transistor	2N2374	VB	1022	V 1
"	"	VB	2022	V 2
PRINTED CIRCUITS:				
Emitter follower		XC	0204	
Weighting network		XC	0036	
Filter		XC	0203	
"		XC	0008	
"		XC	0035	
"		XC	0058	
XC 0204 with components		1612 bl. 801		
XC 0203 " "		1612 bl. 800		
MISCELLANEOUS:				
Cable for battery (1612)		AQ	0008	
Cable for remote control (2305)		AQ	0002	
Rubber foot		DF	7010	
Coaxial jack		JJ	0115	
7-pole jack		JJ	0018	
6-pole jack		JJ	4704	
Coaxial plug		JP	0018	
Mechanical adaptor		JP	0019	
Ground jack		JT	6204	
Case, wood		KA	0012	
Case, metal		KQ	0010	
Frequency dial		SA	0206	
Bakelite knob	30 Ø	SN	0814	
"	54 Ø	SN	3810	
"	30 Ø twin marking	SN	0816	
Pointer for frequency dial		SV	0015	
Housing for freq. Scale		SQ	0188	
Auto-transformer		TQ	0003	T
Motor for automatic switching		UM	0006	
Aut. Switching device		OC	0310	O 3
WEIGHTING NETWORK:				
Electrolytic	40 µF/150 V	CE	2038	C 89
"	2 µF/ 50 V	CE	2648	C 99
Ceramic	5 pF/500 V	CK	0034	C 90

COMPONENT TYPE		STOCK REFERENCE		CIRCUIT DIAGRAM
Polystyrene	3.16 nF ± 2%/200 V	CT	3127	C 94
"	4 nF ± 2%/200 V	CT	3325	C 92,93,95
"	6.3 nF ± 2%/200 V	CT	3346	C 96
"	63 nF ± 2%/100 V	CT	3130	C 97,98
Auto-transformer		LB	0017	L 91
Coil	50 H	LB	0431	L 92
Trimmer pot.m.	150 kΩ lin.	PG	4151	R 94
" "	1MΩ lin.	PG	5102	R 97-99
Carbon film	1/3 W ± 5%	RK	400 Ω	R 89
" "	" ± 2%	RK	3.15 kΩ	R 90,91
" "	" "	RK	14 kΩ	R 92
" "	" "	RK	32 kΩ	R 93
" "	" "	RK	160 kΩ	R 95,96
1/3 OCTAVE FILTERS:				
FILTER 12,5 c/s:				
Polyester	1 µF ± 10%/250V	CS	0025	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4300	R 103,105
" "	250 kΩ lin.	PG	4250	R 104
Coil	80 H	LB	0504	L 102,103
"	80 H	LB	0505	L 101
FILTER 16 c/s:				
Polyester	1 µF ± 10%/250V	CS	0025	C 101-103
"	o.68 µF ± 10%/250V	CS	0023	C 101-103
Trimmer pot.m.	300 kΩ	PG	4300	R 103, 105
"	250 kΩ	PG	4250	R 104
Coil	63 H	LB	0502	L 102,103
"	63 H	LB	0503	L 101
FILTER 20 c/s:				
Polyester	1 µF ± 10%/250V	CS	0025	C 101-103
"	o.22 µF ± 10%/250V	CS	0017	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4300	R 103,105
"	250 kΩ lin.	PG	4250	R 104
Coil	50 H	LB	0501	L 101
"	50 H	LB	0500	L 102,103
FILTER 25 c/s:				
Polyester	1 µF ± 10%/250V	CS	0025	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 104,105
Coil	40 H	LB	0104	L 102,103
"	40 H	LB	0103	L 101
FILTER 31.5 c/s:				
Polyester	330 nF ± 10%/250V	CS	0019	C 101-103
"	470 nF ± 10%/250V	CS	0021	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 104,105
Coil	31.5 H	LB	0106	L 102,103
"	31.5 H	LB	0107	L 101
FILTER 40 c/s:				
Polystyrene	630 nF ± 5%/100V	CT	6107	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 104,105
Coil	25 H	LB	0408	L 102,103
"	25 H	LB	0409	L 101
FILTER 50 c/s:				
Polystyrene	500 nF ± 5%/100V	CT	6106	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 104,105
Coil	20 H	LB	0410	L 102,103
"	20 H	LB	0411	L 101

COMPONENT TYPE		STOCK REFERENCE		CIRCUIT DIAGRAM
FILTER 63 c/s:				
Polystyrene	400 nF ± 5%/100 V	CT	6104	C 101-103
Trimmer pot.m.	150 kΩ lin.	PG	4151	R 105
"	300 kΩ lin.	PG	4301	R 104
Coil	16 H	LB	0412	L 102,103
"	16 H	LB	0413	L 101
FILTER 80 c/s:				
Polystyrene	320 nF ± 5%/100 V	CT	6105	C 101-103
Trimmer pot.m.	150 kΩ lin.	PG	4151	R 105
"	300 kΩ lin.	PG	4301	R 104
Coil	12.5 H	LB	0414	L 102,103
"	12.5 H	LB	0415	L 101
FILTER 100 c/s:				
Polystyrene	250 nF ± 5%/100 V	CT	6102	C 101-103
Trimmer pot.m.	150 kΩ lin.	PG	4151	R 105
"	300 kΩ lin.	PG	4300	R 103
"	300 kΩ lin.	PG	4301	R 104
Coil	10 H	LB	0116	L 102,103
"	10 H	LB	0117	L 101
FILTER 125 c/s:				
Polystyrene	200 nF ± 5%/100 V	CT	6103	C 101-103
Trimmer pot.m.	150 kΩ lin.	PG	4151	R 105
"	300 kΩ lin.	PG	4300	R 103
"	300 kΩ lin.	PG	4301	R 104
Coil	8 H	LB	0118	L 102,103
"	8 H	LB	0119	L 101
FILTER 160 c/s:				
Polystyrene	160 nF ± 5%/100 V	CT	6101	C 101-103
Trimmer pot.m.	150 kΩ lin.	PG	4151	R 105
"	300 kΩ lin.	PG	4300	R 103
"	300 kΩ lin.	PG	4301	R 104
Coil	6.3 H	LB	0120	L 102,103
"	6.3 H	LB	0121	L 101
FILTER 200 c/s:				
Polystyrene	125 nF ± 5%/100 V	CT	6100	C 101-103
Trimmer pot.m.	800 kΩ lin.	PG	5101	R 101
"	300 kΩ lin.	PG	4300	R 103
"	300 kΩ lin.	PG	4301	R 104
"	150 kΩ lin.	PG	4151	R 105
Coil	5 H	LB	0122	L 102,103
"	5 H	LB	0123	L 101
FILTER 250 c/s:				
Polystyrene	100 nF ± 5%/100 V	CT	3433	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 103,104
"	150 kΩ lin.	PG	4151	R 105
Coil	4 H	LB	0429	L 102,103
"	4 H	LB	0430	L 101
FILTER 315 c/s:				
Polystyrene	80 nF ± 5%/100 V	CT	3432	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 103,104
"	150 kΩ lin.	PG	4151	R 105
Coil	3.16 H	LB	0427	L 102,103
"	3.16 H	LB	0428	L 101

COMPONENT		STOCK REFERENCE		CIRCUIT DIAGRAM
FILTER 400 c/s:				
Polystyrene	63 nF ± 5%/100 V	CT	3431	C 101-103
Trimmer pot.m.	500 kΩ lin.	PG	4502	R 101
"	300 kΩ lin.	PG	4301	R 103, 104
"	150 kΩ lin.	PG	4151	R 105
Coil	2.5 H	LB	0419	L 102,103
"	2.5 H	LB	0420	L 101
FILTER 500 c/s:				
Polystyrene	50 nF ± 5%/100 V	CT	3430	C 101-103
Trimmer pot.m.	500 kΩ lin.	PG	4502	R 101
"	300 kΩ lin.	PG	4301	R 103,104
"	150 kΩ lin.	PG	4151	R 105
Coil	2 H	LB	0421	L 102,103
"	2 H	LB	0422	L 101
FILTER 630 c/s:				
Polystyrene	40 nF ± 5%/100 V	CT	3239	C 101-103
Trimmer pot.m.	1 MΩ lin.	PG	5102	R 101
"	300 kΩ lin.	PG	4301	R 103,104
"	150 kΩ lin.	PG	4151	R 105
Coil	1.6 H	LB	0423	L 102,103
"	1.6 H	LB	0424	L 101
FILTER 800 c/s:				
Polystyrene	31.5 nF ± 5%/100 V	CT	3238	C 101-103
Trimmer pot.m.	1 MΩ lin.	PG	5102	R 101
"	300 kΩ lin.	PG	4301	R 103,104
"	150 kΩ lin.	PG	4151	R 105
Coil	1.25 H	LB	0425	L 102,103
"	1.25 H	LB	0426	L 101
FILTER 1 k c/s:				
Polystyrene	25 nF ± 5%/100 V	CT	3237	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	1 H	LB	0440	L 102,103
"	1 H	LB	0441	L 101
FILTER 1.25 k c/s:				
Polystyrene	20 nF ± 5%/200 V	CT	3230	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103, 105
Coil	800 mH	LB	0442	L 102,103
"	800 mH	LB	0443	L 101
FILTER 1.6 k c/s:				
Polystyrene	16 nF ± 5%/100 V	CT	3236	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	640 mH	LB	0444	L 102,103
"	640 mH	LB	0445	L 101
FILTER 2 k c/s:				
Polystyrene	12.5 nF ± 5%/200 V	CT	3235	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	500 mH	LB	0446	L 102,103
"	500 mH	LB	0447	L 101

COMPONENT TYPE		STOCK REFERENCE		CIRCUIT DIAGRAM
FILTER 2.5 k c/s:				
Polystyrene	10 nF ± 5%/200 V	CT	3228	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	400 mH	LB	0432	L 102,103
"	400 mH	LB	0433	L 101
FILTER 3.15 k c/s:				
Polystyrene	8 nF ± 5%/200 V	CT	3227	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	320 mH	LB	0434	L 102,103
"	320 mH	LB	0435	L 101
FILTER 4 k c/s:				
Polystyrene	6.3 nF ± 5%/200 V	CT	3234	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	250 mH	LB	0436	L 102,103
"	250 mH	LB	0437	L 101
FILTER 5 k c/s:				
Polystyrene	5 nF ± 5%/200 V	CT	3226	C 101-103
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	200 mH	LB	0438	L 102,103
"	200 mH	LB	0439	L 101
FILTER 6.3 k c/s:				
Polystyrene	4 nF ± 5%/200 V	CT	3225	C 101-103
Trimmer, ceramic	10-40 pF/250 V	CV	0019	"C"
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	144 mH	LB	0526	L 102,103
"	144 mH	LB	0527	L 101
FILTER 8 k c/s:				
Polystyrene	3.2 nF ± 5%/200 V	CT	3233	C 101-103
Trimmer, ceramic	10-40 pF/250 V	CV	0019	"C"
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	113 mH	LB	0528	L 102,103
"	113 mH	LB	0529	L 101
FILTER 10 k c/s:				
Polystyrene	2.5 nF ± 5%/400 V	CT	3223	C 101-103
Trimmer, ceramic	10-40 pF/250 V	CV	0019	"C"
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	90 mH	LB	0530	L 102,103
"	90 mH	LB	0531	L 101

COMPONENT TYPE		STOCK REFERENCE		CIRCUIT DIAGRAM
FILTER 12.5 k c/s:				
Polystyrene	2 nF ± 5%/400 V	CT	3222	C 101-103
Trimmer, ceramic	10-40 pF/250 V	CV	0019	"C"
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	71.5 mH	LB	0532	L 102,103
"	71.5 mH	LB	0533	L 101
FILTER 16 k c/s:				
Polystyrene	1.6 nF ± 5%/400 V	CT	3232	C 101-103
Trimmer, ceramic	10-40pF/250 V	CV	0019	"C"
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	56.8 mH	LB	0534	L 103
"	55.5 mH	LB	0535	L 102
FILTER 20 k c/s:				
Polystyrene	1.25 nF ± 5%/400 V	CT	3219	C 101-103
Trimmer, ceramic	10-40pF/250 V	CV	0019	"C"
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	45.1 mH	LB	0537	L 103
"	44.1 mH	LB	0538	L 102
"	45.1 mH	LB	0539	L 101
FILTER 25 k c/s:				
Polystyrene	1 nF ± 5%/500 V	CT	0118	C 101-103
Trimmer, ceramic	10-40pF/250 V	CV	0019	"C"
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	35.8 mH	LB	0540	L 103
"	34.8 mH	LB	0541	L 102
"	35.8 mH	LB	0542	L 101
FILTER 31.5 k c/s:				
Polystyrene	0.8 nF ± 5%/500 V	CT	0116	C 101-103
Trimmer, ceramic	10-40pF/250 V	CV	0019	"C"
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	28.5 mH	LB	0543	L 103
"	27.8 mH	LB	0544	L 102
"	28.5 mH	LB	0545	L 101
FILTER 40 k c/s:				
Polystyrene	0.63 nF ± 5%/400 V	CT	3214	C 101-103
Trimmer, ceramic	10-40pF/250 V	CV	0019	"C"
Trimmer pot.m.	300 kΩ lin.	PG	4301	R 101,104
"	500 kΩ lin.	PG	4502	R 102
"	150 kΩ lin.	PG	4151	R 103,105
Coil	22.6 mH	LB	0546	L 103
"	21.6 mH	LB	0547	L 102
"	22.6 mH	LB	0548	L 101

Circuit Diagram

valid from serial no. 130631

Filter No.	Frequency c/s	L101, 102 and 103 H	C 101–103 nF	R101 kΩ	R102 kΩ	R103 kΩ	R104 kΩ	R105 kΩ
ZS 0146	12,5	80	2000				250	300
	16	63	1600				"	"
	20	50	1250				"	"
ZS 0048	25	40	1000				300	"
ZS 0049	31,5	31,5	800				"	"
ZS 0029	40	25	630				"	"
	50	20	500				"	"
ZS 0030	63	16	400				"	150
	80	12,5	315				"	"
ZS 0031	100	10	250			300	"	"
	125	8	200			"	"	"
ZS 0032	160	6,3	160			"	"	"
	200	5	125	(800)		"	"	"
ZS 0150	250	4	100			"	"	"
	315	3,15	80			"	"	"
ZS 0151	400	2,5	63	1000		"	"	"
	500	2	50	500		"	"	"
	630	1,6	40	1000		"	"	"
	X 800	1,25	31,5	500		"	"	"
ZS 0152	X 1000	1,0	25	500		150	"	"
	X 1250	0,8	20	300	500	"	"	"
	X 1600	0,63	16	"	"	"	"	"
	X 2000	0,5	12,5	"	"	"	"	"
ZS 0153	X 2500	0,4	10	"	"	"	"	"
	3150	0,315	8	"	"	"	"	"
	4000	0,25	6,3	"	"	"	"	"
	5000	0,2	5	"	"	"	"	"
ZS 0039	6300	0,16	4	"	"	"	"	"
	8000	0,125	3,15	"	"	"	"	"
	10000	0,1	2,5	"	"	"	"	"
	12500	0,08	2	"	"	"	"	"
	16000	0,063	1,6	"	"	"	"	"
ZS 0142	20000	0,05	1,25	150	"	"	"	"
	25000	0,04	1,0	"	"	"	"	"
	31500	0,0315	0,8	"	"	"	"	"
	40000	0,025	0,63	"	"	"	"	"